AIR QUALITY IN THE FOUR CORNERS

Ship Rock as seen from Mesa Verde National Park (left: clear vs. right: haze)

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Topics

- What air quality issues affect Four Corners public health, visibility and environment?
  - Wildfires
  - Ozone
  - Dust
- Air quality tools you can use

Wildfire

- Many wildfires in 2012 (and 2013), both in-state and out of state
- Wildfire smoke affected air quality on many days
- Air quality concerns:
  - Visibility/Haze
  - Public Health (from ozone and particulates)

Wildfire Example

West Fork Complex Fire, northwest of Wolf Creek Pass

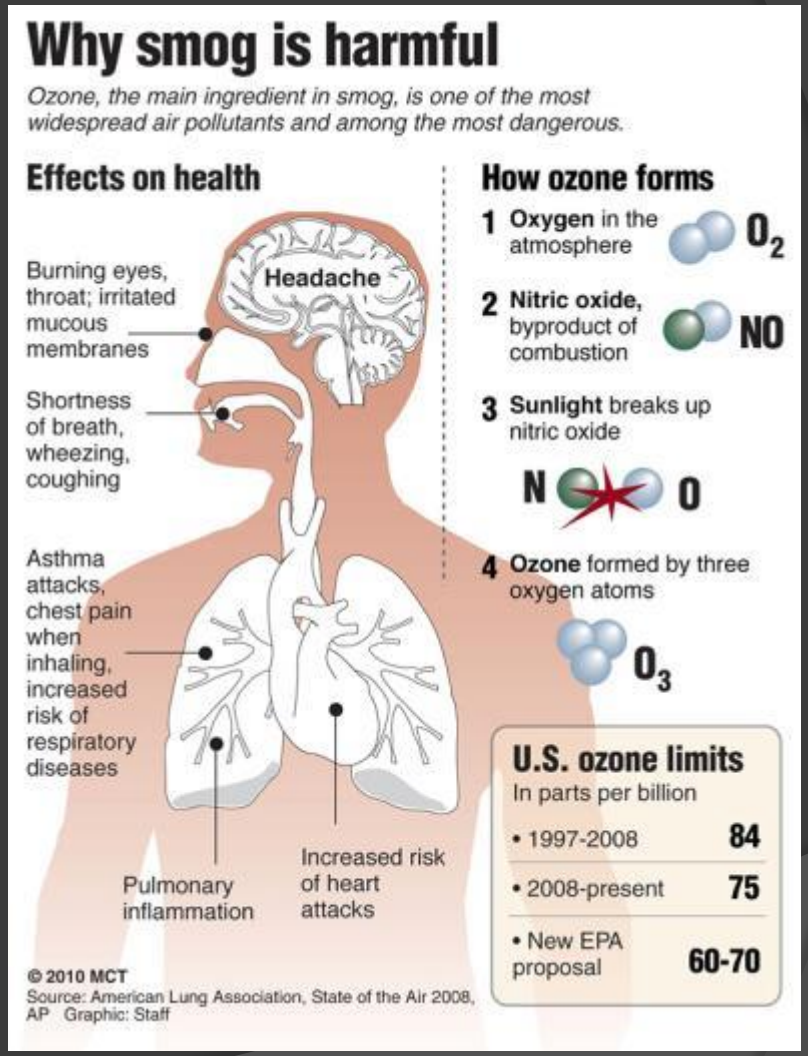
Photo Credit: Pike Hot Shot/Twitter

Studies & Recommendations

- Air Quality and Health Impacts of June 2012 Colorado Wildfires (NCAR/CDPHE/CSU)
- Health Outcomes Associated with Smoke Exposure in Albuquerque, New Mexico during 2011 Wallow Fire (New Mexico Health Department)
- Health recommendations for Wildfire Smoke: http://www.nationaljewish.org/about/mediacenter/pressreleases/2012/wildfire-smoke/

Ozone

- Typically occurs during sunny, high-temperature conditions (late spring, summer, early fall)
- Usually formed in heat of afternoon and early evening, dissipating during cooler nights



AQI & EPA Standards

75 ppb 8-hour Ozone Standard

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

35 ug/m^3 24-hour PM2.5 Standard

Health Effects of Ozone & $PM_{2.5}$

- **SYMPTOMS:**
- **Airways can become irritated and inflamed**
- **Makes it more difficult to breathe deeply and vigorously**
- **Coughing and sore or scratchy throat**
- **Aggravates lung diseases such as asthma; emphysema; and chronic bronchitis**
- **Makes lungs more susceptible to infection**
- **Continues damage lungs even when the symptoms have disappeared**
- **Causes increased mortality**

- Who's at Risk?
  - Children who are active outdoors
  - Adults who work or exercise vigorously outdoors
  - People with respiratory diseases such as asthma or emphysema
  - People with unusual susceptibility to ozone

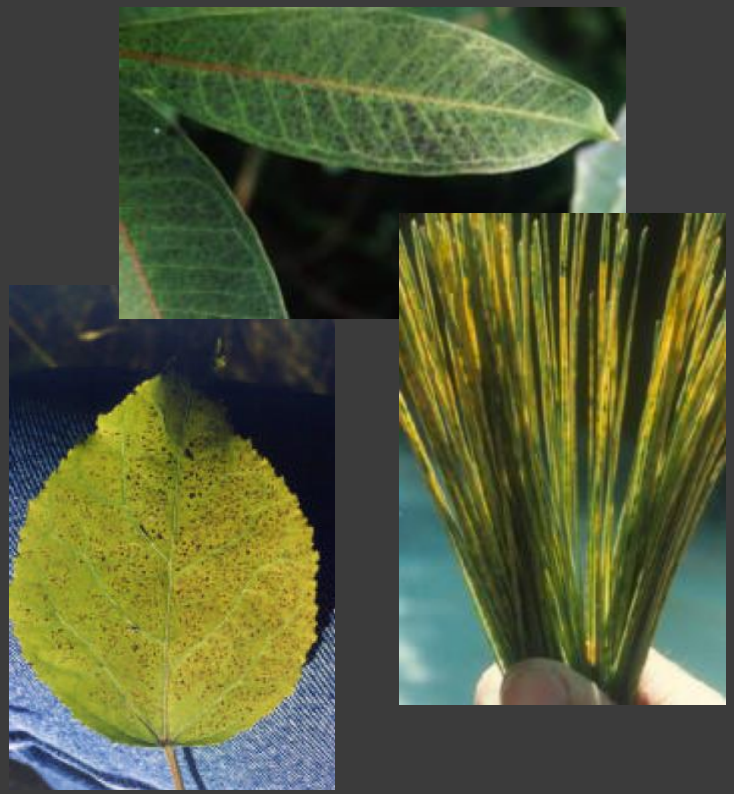
Ozone & Smoke

- **Sunshine, combined with man-made urban and industrial emissions, result in elevated ozone levels**
- **Though not a major contributor, wildfires can also impact ozone levels, in *both* directions!**
  - **Thick "fresh" smoke blocks sunlight, reducing ozone**
  - **Smoke ("aged") contains chemicals which can react in sunlight to form ozone**
  - **Particles in the smoke can interfere with ozone instrumentation, which appears as an increase in ozone**

Ozone Injury to Vegetation

Visible Injury

Stippling and chlorosis



Reduced Photosynthesis

- decreased plant productivity
- decreased growth and reproduction
- decreased water use efficiency
- decreased carbon storage, carbon sequestration
- increased vulnerability to insects, disease, drought, fire

Dust

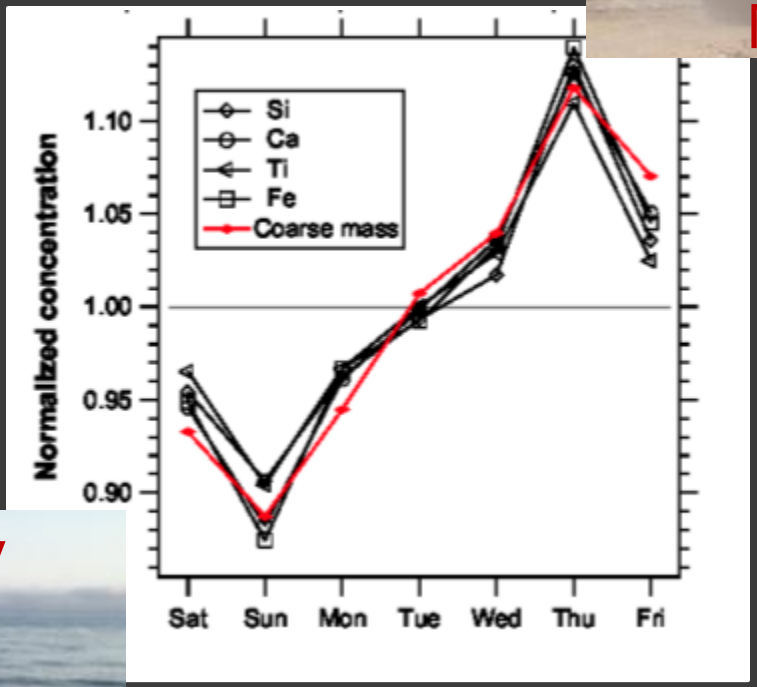
- Dust originates from man-made and natural disturbances
  - Construction, traffic, recreation, agriculture
  - Wildfires, erosion, floods, drought
- Dust is increasing throughout the West
- How can we protect public health from widespread dust particles?

Photo credit: Todd Fitchette July, 2011

Wind blown dust

Human activity dust

Humans work on a weekly schedule – Nature does not



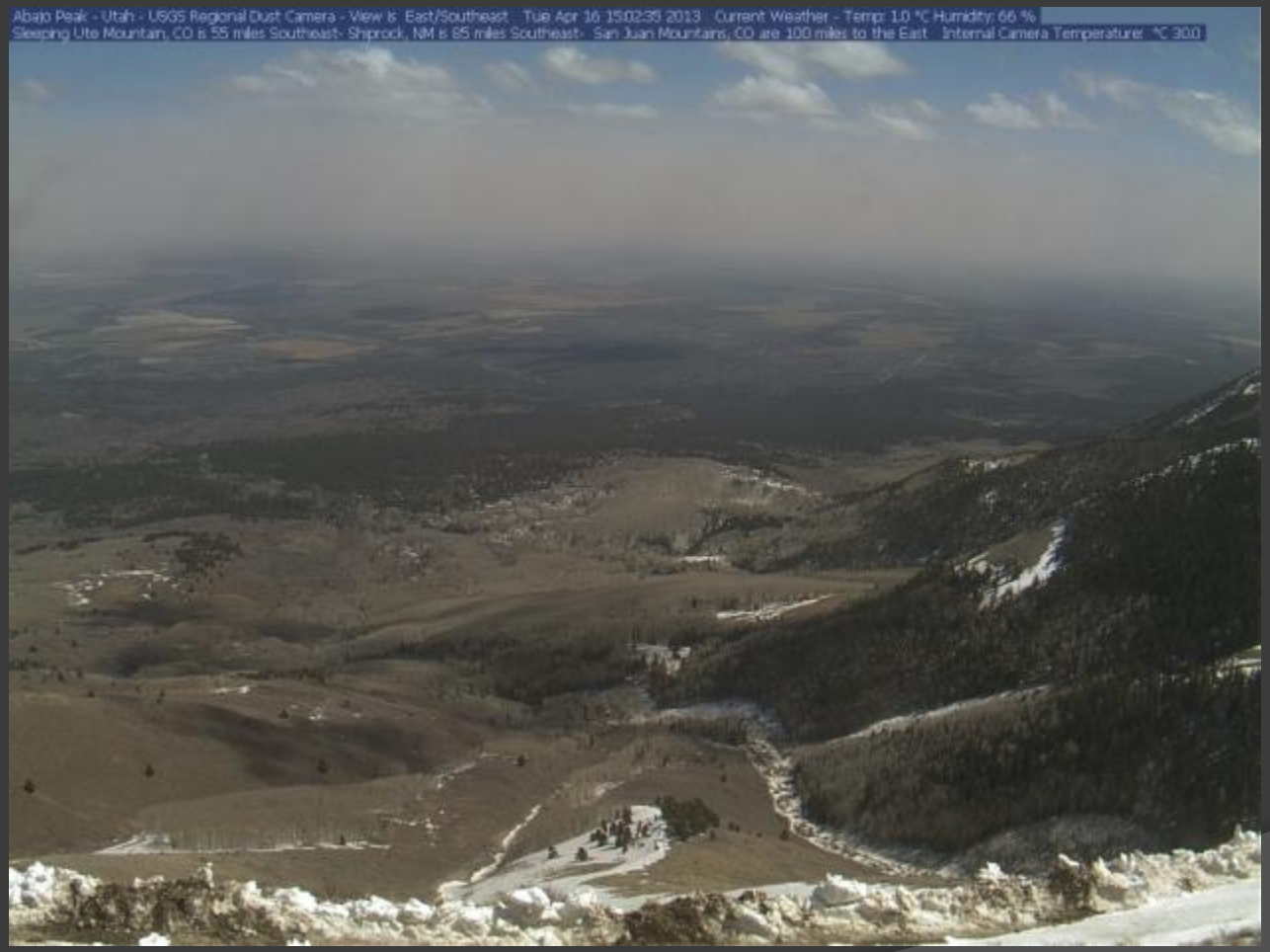
- Soil and dust are low on the weekends and increase during the week.
- A clear signal of impact from human activities

Health Effects of Dust (PM_{10})

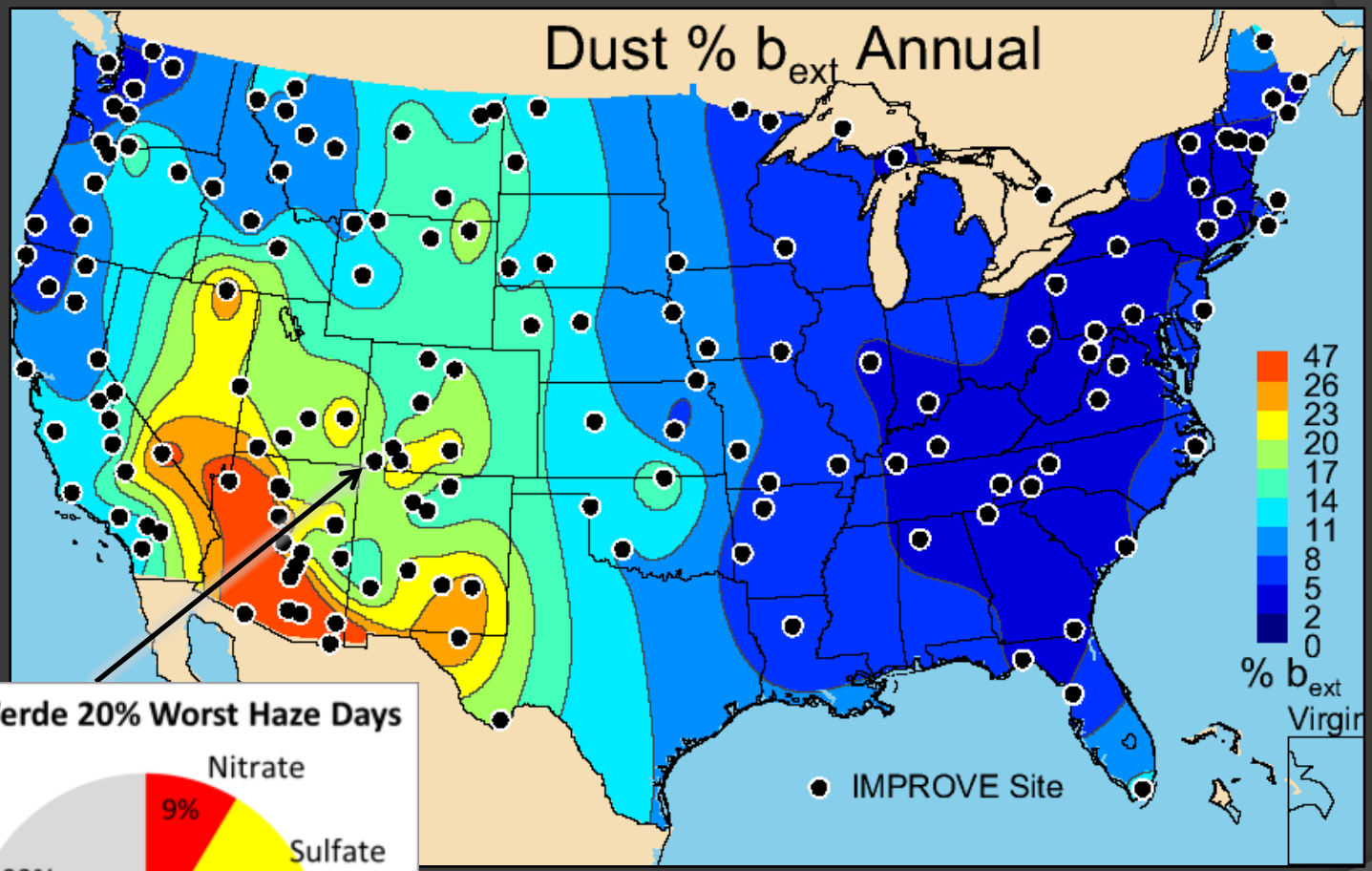
- **SYMPTOMS:**
- **Similar to Ozone and $PM_{2.5}$**
- **Cannot make it as deep into the lungs as smaller particles**
- **Health effects not as severe**
- **Irritating to throat, induces coughing, wheezing, shortness of breath**
- **Lung damage**
- **Aggravated asthma**

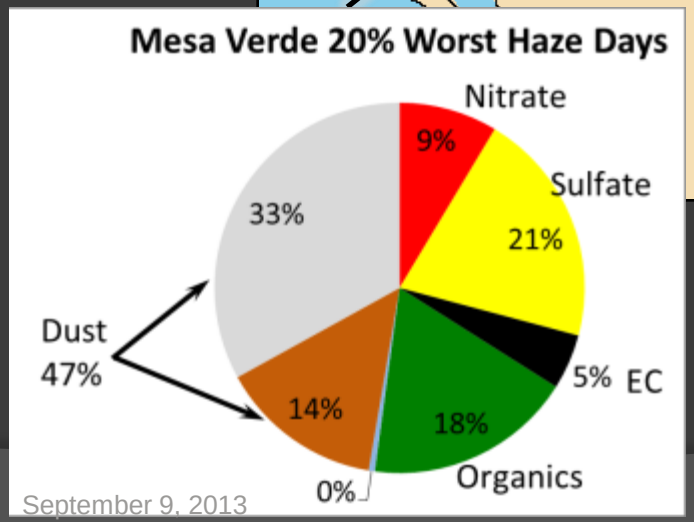
- Who's at Risk?
  - Children who are active outdoors
  - Adults who work or exercise vigorously outdoors
  - People with respiratory diseases such as asthma or emphysema
  - **People with heart conditions**

Dust Storm Example

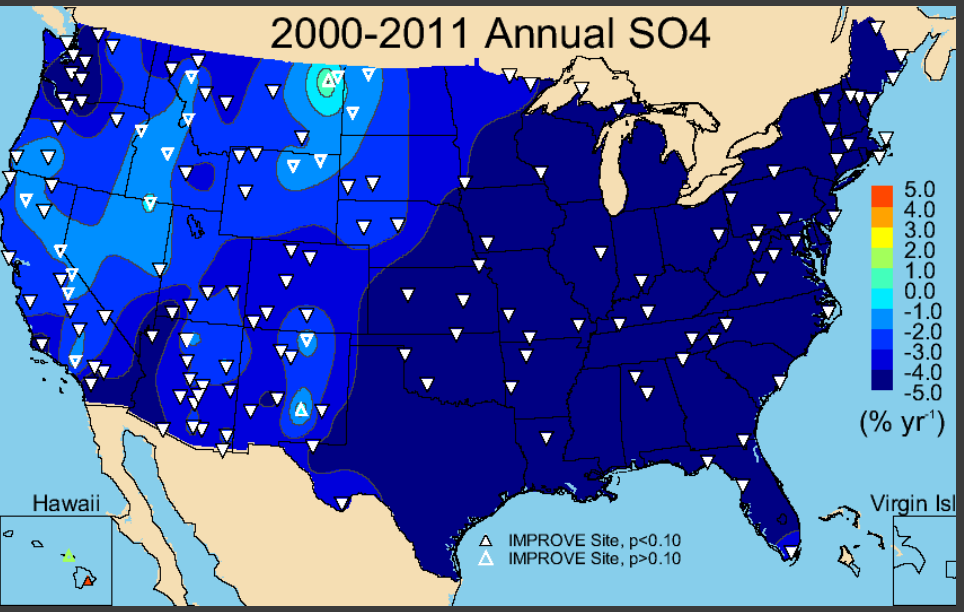


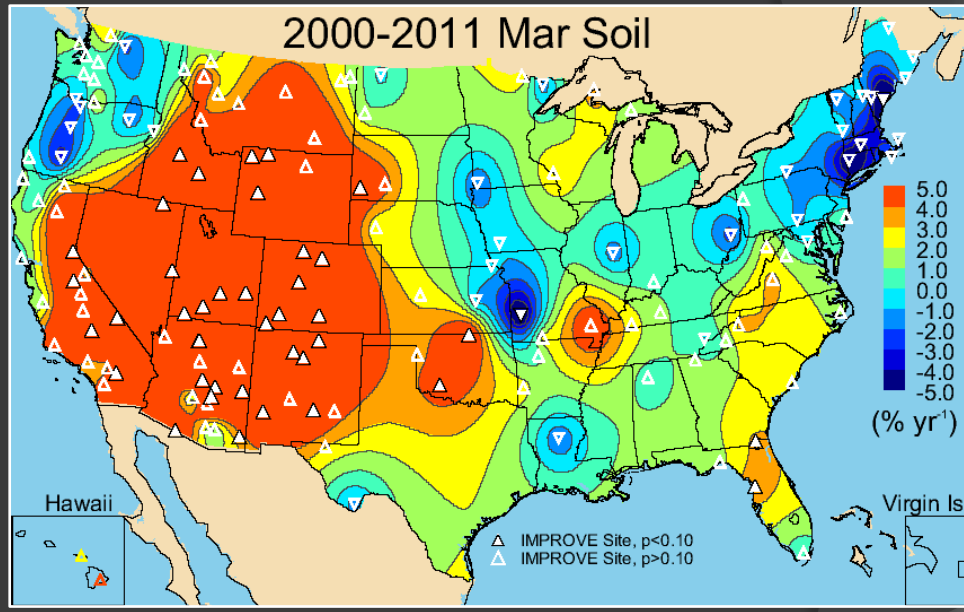
Contributions of Dust to Visibility/Haze





Trends in Particulate Matter Causing Haze





- Ambient concentrations of sulfate and nitrate and their precursor emissions have generally decreased throughout the U.S. and West

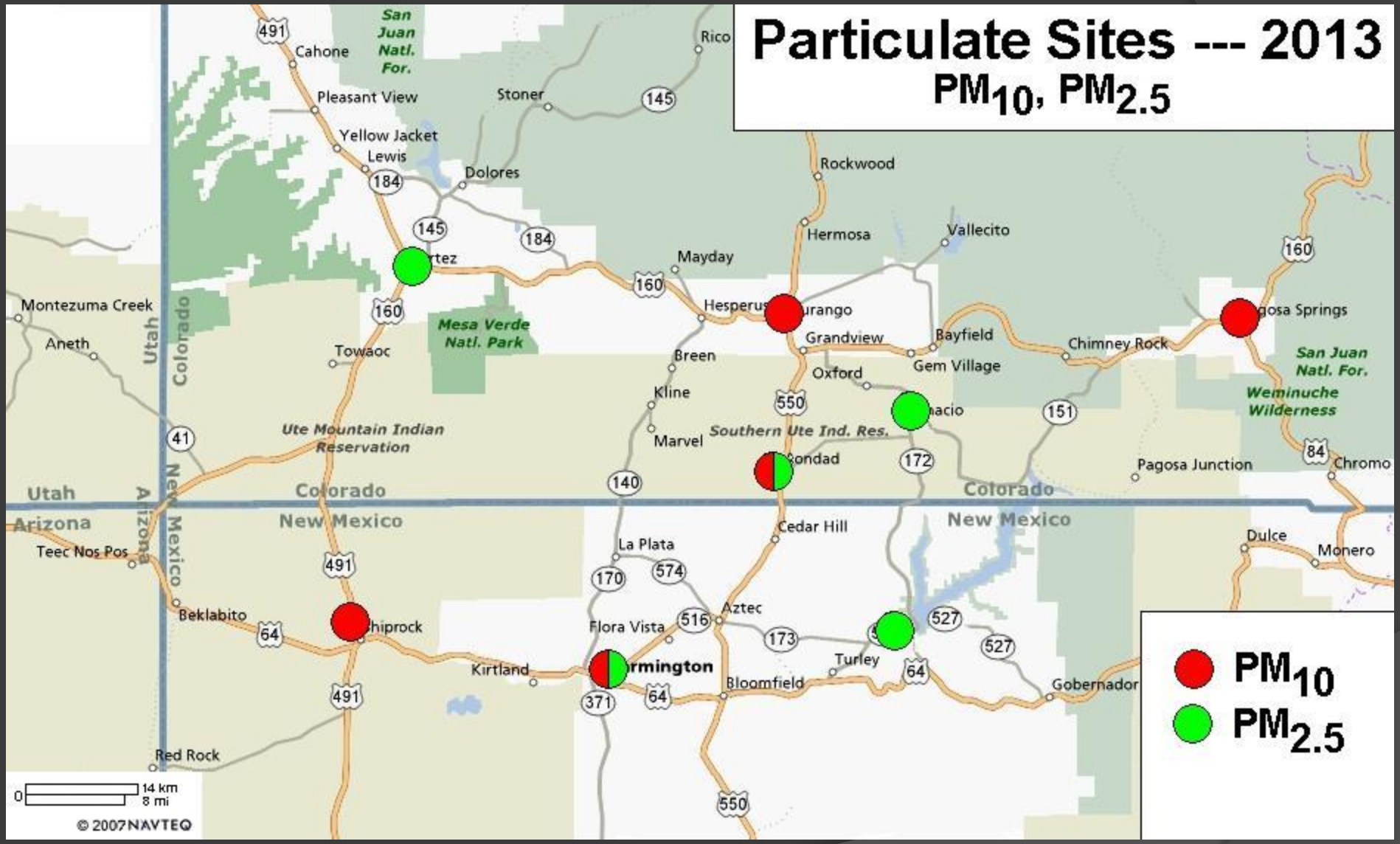
- Soil has increased in many western U.S. locations, particularly during the spring months
- Increased dust has offset some benefits from decreased sulfate and nitrate concentrations

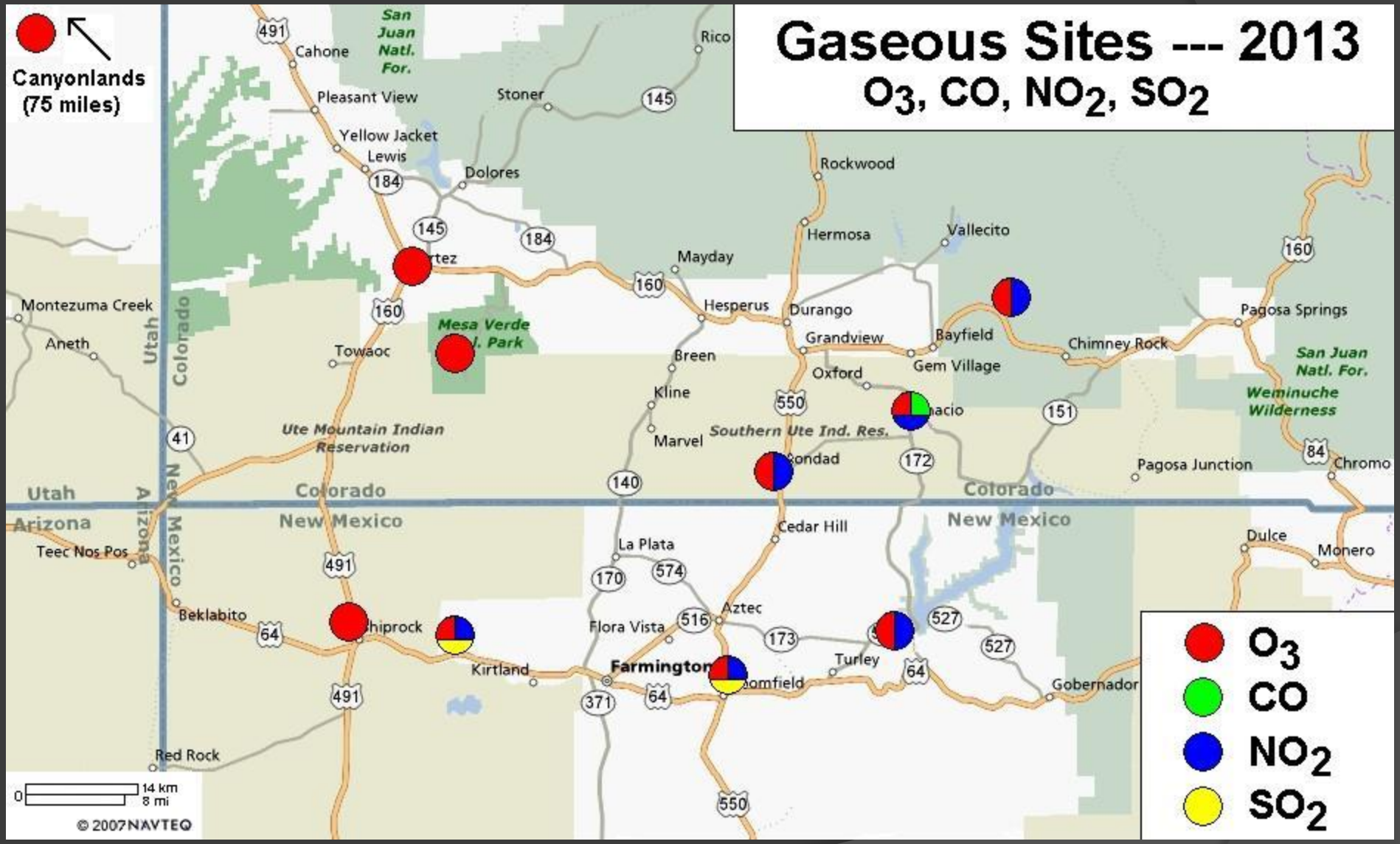
Visibility/Haze

- Dust significant contributor to haze in the Four Corners region and has increased in the Four Corners region
- Dust has natural and human sources, but ambient concentrations have a strong weekly cycle – a clear signal of human contributions
- Wildfires, both in Colorado and in other western states, generate smoke which creates haze and visibility issues

Best Available Retrofit Technology for San Juan Generating Station

AIR QUALITY TOOLS FOR CITIZENS


Particulate Sites --- 2013
PM10, PM2.5
San Juan Natl. For.
Cahone
Pleasant View
Yellow Jacket
Lewis
Dolores
Stoner
Rico
Rockwood
Hermosa
Vallecito
Mayday
Montezuma Creek
Aneth
Utah
Colorado
Towaoc
Mesa Verde Natl. Park
Breen
Kline
Marvel
Oxford
Grandview
Bayfield
Gem Village
Chimney Rock
San Juan Natl. For.
Weminuche Wilderness
Pagosa Springs
Pagosa Junction
Chromo
Ute Mountain Indian Reservation
Southern Ute Ind. Res.
Utah
Arizona
New Mexico
Colorado
Teec Nos Pos
Beklabito
Cedar Hill
La Plata
Flora Vista
Aztec
Kirtland
Bloomfield
Turley
Gobernador
Dulce
Monero
Red Rock
0
14 km
8 mi
© 2007 NAVTEQ
PM10
PM2.5


Gaseous Sites --- 2013
O3, CO, NO2, SO2
Canyonlands (75 miles)
San Juan Natl. For.
Cahone
Pleasant View
Stoner
Rico
Yellow Jacket
Lewis
Dolores
Rockwood
Hermosa
Vallecito
Mayday
Montezuma Creek
Aneth
Utah
Colorado
Towaoc
Mesa Verde Nat. Park
Hesperus
Durango
Grandview
Bayfield
Chimney Rock
Pagosa Springs
San Juan Natl. For.
Weminuche Wilderness
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Cedar Hill
La Plata
Dulce
Monero
Beklabito
Flora Vista
Aztec
Kirtland
Farmington
Turley
Gobernador
Red Rock
0
14 km
8 mi
© 2007 NAVTEQ
O3
CO
NO2
SO2

Southern Ute Indian Tribes' Air Quality Program

Ute 3 monitoring station (Bondad):

- Gas parameters include: NOx and O3
- Continuous FEM PM10 and PM2.5 monitor
- FRM PM2.5 (1 in 6 days) monitor
- Visibility
- Meteorological parameters include: wind speed, wind direction, ambient temperature, relative humidity, solar, and precipitation

Ute 1 monitoring station (Ignacio):

- Gas parameters include: NOx, O3 and CO
- FRM PM2.5 (1 in 6 days) monitor
- Meteorological parameters include: wind speed, wind direction, ambient temperature, relative humidity, solar, and precipitation

Four Corners Advisory Examples

Grand Valley – 5/23/2010

- Blowing dust advisories
- Wildfire smoke health advisories
- Fine particulates (typically winter)
- Ozone (typically summer)

Why Air Quality Index?

- EPA-preferred method
- Health-based
- Consistent with most other areas
- Multi-pollutant
- Conflict resolution (Example: No more Colorado “Red” advisory when AQI value is in the Green category)

AirNow

Local Air Quality Conditions

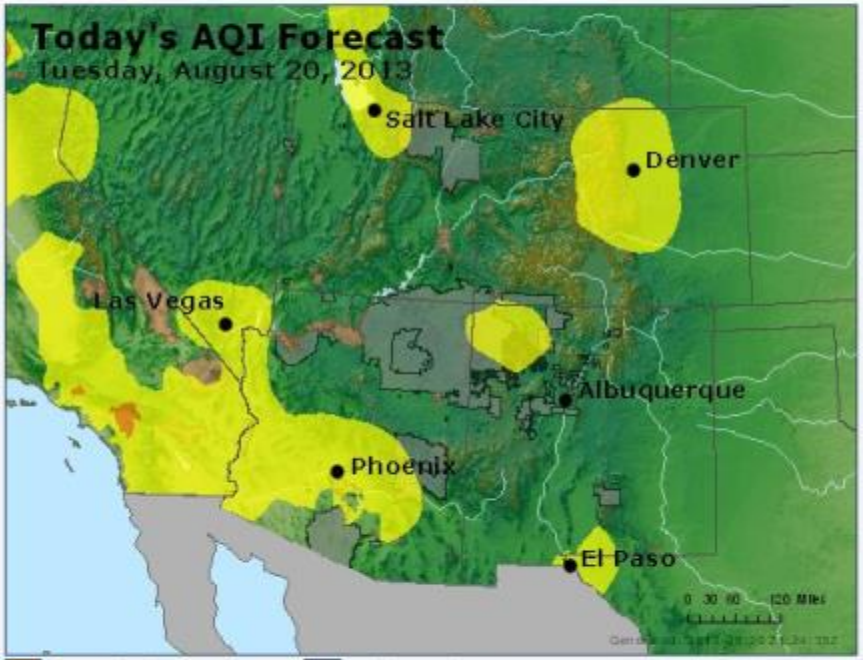
Zip Code: Go State : Colorado Go National Summary

AIRNow Home >> **Colorado**

Data courtesy of: Colorado Department of Public Health and Environment (DPHE)

Air Quality Forecast & Colorado Smoke Advisories

Forecast | Current AQI | More Maps



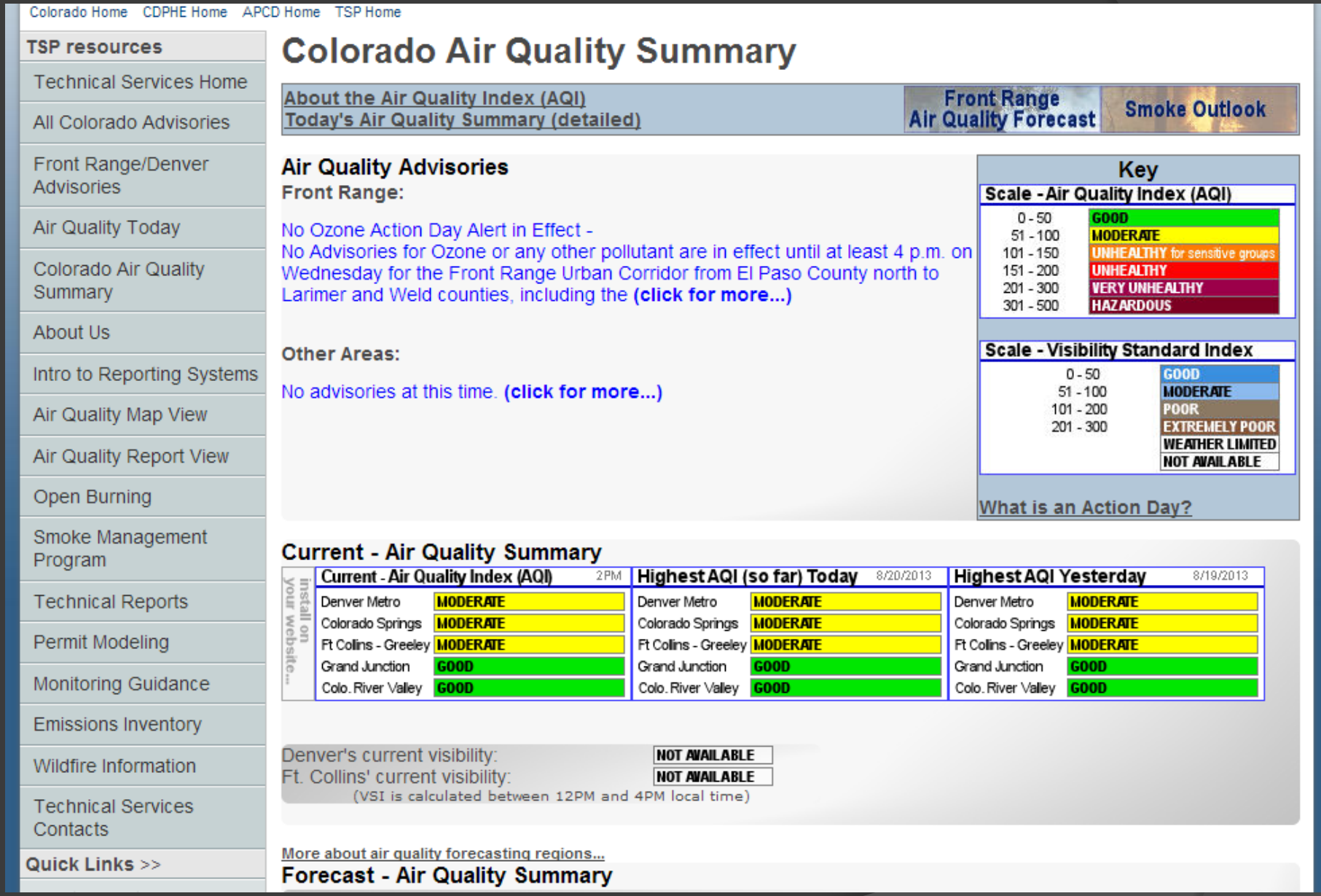
National Parks/Monuments Tribal Boundaries

The tribal boundaries shown here are provided by the Bureau of Indian Affairs and are intended to be used as a general spatial reference only. They are not a formal determination of tribal boundaries by the EPA.

Click on the city name for more detailed information. printable summary	FORECAST Tue Aug 20	FORECAST Wed Aug 21	CURRENT AQI
Colorado River Valley	Good	Good	36
Colorado Springs	Mod	Mod	61
Denver	Mod	Mod	93
Fort Collins	Mod	Mod	80
Four Corners Area	Good	Good	46
Grand Junction	Good	Good	37
Greeley	Mod	Mod	49
Mesa Verde National Park	n/a	n/a	46
Rocky Mountain National Park	61	45	80

Good | Moderate | USG | Unhealthy | Very Unhealthy | Hazardous | ! Action Day

State Air Quality Resources



http://www.colorado.gov/airquality/colorado_summary.aspx

CDPHE's Smoke Messaging

Through CDPHE's website, social media (Facebook & Twitter), EnviroFlash, telephone hotlines and media advisories:

"If visibility is less than 5 miles, smoke has reached levels that are unhealthy. If smoke is thick or becomes thick, remain indoors. This is especially true for those with heart disease, respiratory illnesses, the very young, and the elderly. Consider limiting outdoor activity when moderate to heavy smoke is present. Consider relocating temporarily if smoke is present indoors and is making you ill."

http://www.colorado.gov/airquality/addendum.aspx#smoke

Install Smoke Outlook Thumbnail on your website!

- http://www.colorado.gov/airquality/install_thumbnail.aspx

BurnWise Program

- EPA educational campaign
- Messages include:
  - Cost savings
  - Improved safety and health benefits
  - Energy efficiency
- Brochures and outreach materials available at: http://www.epa.gov/burnwise/burnwisekit.html

Monument Valley, Four Corners Monument

QUESTIONS?

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